

REMARKS

The title of Table 4 on page 19 of the specification has been amended to correctly label the table "LIQUIDUS TEMPERATURE (°C)." Support for this amendment may be found on page 20, lines 5-12, where it is explained that: "It is found from Table 4 that the liquidus temperature is minimized when the Ag content is 3.5 wt.% and the Cu content is 0.8 wt.% and that the liquidus temperature rises if the Ag content is increased or decreased from 3.5 wt.% and the Cu content is increased or decreased from 0.8 wt.%."

Claims 1-14 have been rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, as being obvious (35 U.S.C. § 103(a)) over WO9834755. The Examiner argues that this reference discloses a Pb-free Sn-based solder composition with lower limits about the same as the claimed upper limits of Ag and Cu in the rejected claims. He then argues that the claimed Pb-free Sn-based solder compositions are overlapped by the cited references and, therefore, that the material properties recited by applicants' claims would have been inherently possessed by the teachings of the cited reference. The Examiner does, however, acknowledge that the cited reference does not disclose dissolution rate, liquidus temperature or viscosity.

The rejection is believed to be improper because the Examiner does not heed the clear showing in the specification of the criticality of containing the Ni content in the range of 0.02 wt.% to 0.06 wt.%. This is explained in the specification on page 21, lines 11-21 where it is noted that when the Ni content is less than 0.02 wt.%, the suppression of the "copper leaching" is insufficient. On the other hand, as also explained there, when the Ni content is greater than 0.06 wt.%, the liquidus temperature is excessively high, causing a danger that some defect may occur in the PWB and/or electronic components. Likewise, it is explained on page 22, lines 3-20, that when the Fe content is less than 0.02 wt.%, the suppression of the "copper leaching" is

insufficient and that if the Fe content is greater than 0.06 wt.%, the viscosity is excessively high, causing problems with the uniformity of the thickness of the coated solder on the copper circuit layers of the PWB when the solder is coated by the hot-air leveling method. Moreover, when the viscosity is excessively high, there is a possibility that the circuit layers will not be fully coated by the solder and that unwanted solder bridges will be formed between the adjoining circuit lines.

Furthermore, the specification on page 12, lines 16-18, points out that from Figure 1 and Table 1, that the higher the copper dissolution rate (as in WO98/34755), the more easily the copper leaching phenomenon progresses. Therefore, the lowering of the copper dissolution rate as in the claimed invention helps suppresses the copper leaching phenomenon. Also, Table 4 (specification, p. 20, l. 5 to p. 21, l. 5) shows that the liquidus temperature is minimized when the Ag content is 3.5 wt.% and the Cu content is 0.8 wt.% and that the liquidus temperature rises if the Ag content is increased or decreased from 0.8 wt.%. As described with reference to Table 2, the alloy containing 3.5 wt.% of Ag and 0.8 wt.% of Cu has a minimum wetting time of 1.16 second and a copper dissolution rate of 0.13 $\mu\text{m}/\text{sec}$. Also, it is found from Table 4 that the liquidus temperature is relatively lower when the Cu content is in the range from 0.4 wt.% to 1.2 wt.%. The liquidus temperature is relatively lower when the Ag content is in the range from 1 wt.% to 4 wt.%. On the other hand, it is found from Table 5 that the copper dissolution rate increases as the Cu and Ag contents are increased.

The above data demonstrates that the Cu and Ag ranges of WO98/34755 teach away from the present invention, as claimed.

This application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the

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Examiner, a telephone conference would expedite the prosecution of the subject application,
the Examiner is invited to call the undersigned attorney.

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Respectfully submitted,


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